

THAT WHICH IS CLAIMED IS:

1. A method for patterning a layer on a substrate, the method comprising the steps of:
- 5 projecting coherent radiation toward a reflector surface so that the coherent radiation is reflected off the reflector surface to provide a holographic projection of a desired image wherein the reflector surface includes information that corresponds to an inverse of the holographic projection of the desired image; and
- 10 maintaining the substrate including the layer in the path of the of the reflected radiation so that the holographic projection is projected onto the layer.
- 15 ^{Sub A1} 2. A method according to Claim 1 further comprising the step of: developing the layer so that portions thereof are maintained and removed according to the intensity of the holographic projection of the desired image thereon.
- 20 3. A method according to Claim 1 wherein the layer comprises an oxide layer that is activated on exposure to portions of the holographic projection of the desired image having sufficient intensity, so that activated portions of the oxide layer can be selectively removed, maintained, or modified.
- 25 4. A method according to Claim 1 wherein the layer comprises a silicon layer that is activated on exposure to portions of the holographic projection of the desired image having sufficient intensity, so that activated portions of the silicon layer can be selectively oxidized or modified.
- 30 5. A method according to Claim 1 wherein the step of projecting coherent radiation comprises projecting a coherent beam of electrons.

6. A method according to Claim 5 wherein the step of projecting coherent radiation further comprises generating the coherent beam of electrons from a nanotip field emitter.

5 7. A method according to Claim 6 wherein the nanotip field emitter comprises a tip having dimensions on the order of an atom.

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A2 > 8. A method according to Claim 1 wherein the step of projecting coherent radiation comprises projecting laser radiation.

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9. A method according to Claim 1 wherein the holographic projection of the desired image comprises a Fresnel hologram.

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10. A method according to Claim 1 wherein the step of projecting the coherent radiation comprises projecting the coherent radiation along divergent paths.

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11. A method according to Claim 1 further comprising:
filtering the coherent radiation reflected off the reflector surface to reduce transmission of portions of the interference pattern corresponding to defects on the reflector surface.

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12. A method according to Claim 1 wherein projecting coherent radiation comprises projecting two beams of coherent radiation toward the reflector surface.

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13. A method according to Claim 1 further comprising:
projecting coherent radiation toward a second reflector surface so that the coherent radiation is reflected off the second reflector surface to provide a second holographic projection of reflected radiation;

wherein maintaining the substrate further comprises maintaining the substrate including the layer in the path of the radiation reflected off the

second reflector surface so that the second holographic projection is projected onto the layer.

14. A method according to Claim 1 further comprising:
5 projecting a portion of the coherent radiation to the layer without reflecting off the reflector surface.

15. A system for patterning a layer on a substrate, the system comprising:
10 means for projecting coherent radiation toward a reflector surface so that the coherent radiation is reflected off the reflector surface to provide a holographic projection of a desired image wherein the reflector surface includes information that corresponds to an inverse of the holographic projection of the desired image; and
15 means for maintaining the substrate including the layer in the path of the of the reflected radiation so that the holographic projection of the desired image is projected onto the layer.

16. A system according to Claim 15 wherein the layer comprises an oxide layer that is activated on exposure to portions of the holographic projection of the desired image having sufficient intensity, so that activated portions of the oxide layer can be selectively removed, maintained, or modified.

17. A system according to Claim 15 wherein the layer comprises a silicon layer that is activated on exposure to portions of the holographic projection of the desired image having sufficient intensity, so that activated portions of the silicon layer can be selectively oxidized or modified.

18. A system according to Claim 15 wherein the means for projecting coherent radiation comprises means for projecting a coherent beam of electrons.

19. A system according to Claim 18 wherein the means for projecting coherent radiation further comprises means for generating the coherent beam of electrons from a nanotip field emitter.

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20. A system according to Claim 19 wherein the nanotip field emitter comprises a tip having dimensions on the order of an atom.

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SUB 21. A system according to Claim 15 wherein the means for projecting coherent radiation comprises means for projecting laser radiation

22. A system according to Claim 15 wherein the holographic projection of the desired image comprises a Fresnel hologram.

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23. A system according to Claim 15 wherein the means for projecting the coherent radiation comprises means for projecting the coherent radiation along divergent paths.

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24. A system according to Claim 15 further comprising:
means for filtering the coherent radiation reflected off the reflector surface to reduce transmission of portions of the interference pattern corresponding to defects on the reflector surface.

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25. A system according to Claim 15 wherein the means for projecting coherent radiation comprises means for projecting two beams of coherent radiation toward the reflector surface.

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26. A system according to Claim 15 further comprising:
means for projecting coherent radiation toward a second reflector surface so that the coherent radiation is reflected off the second reflector surface to provide a second holographic projection of reflected radiation; and

means for maintaining the substrate including the layer in the path of the radiation reflected off the second reflector surface so that the second holographic projection is projected onto the layer.

5 27. A system according to Claim 15 further comprising:
 means for projecting a portion of the coherent radiation to the substrate including the layer without reflecting off the reflector surface.

10 28. A system for patterning a layer on a substrate surface, the system comprising:
 a radiation source that is configured to project coherent radiation toward a reflector surface so that the coherent radiation is reflected off the reflector surface to project a holographic projection of a desired image on the layer so that the holographic image of the desired image is used to pattern the
15 layer.

20 29. A system according to Claim 28 wherein the layer comprises an oxide layer that is activated on exposure to portions of the holographic projection of the desired image having sufficient intensity, so that activated portions of the oxide layer can be removed, maintained, or modified.

25 30. A system according to Claim 28 wherein the layer comprises a silicon layer that is activated on exposure to portions of the holographic projection of the desired image having sufficient intensity, so that activated portions of the silicon layer can be selectively oxidized or modified.

31. A system according to Claim 28 wherein the coherent radiation comprises a coherent beam of electrons.

30 32. A system according to Claim 31 wherein the radiation source comprises a nanotip field emitter.

33. A system according to Claim 32 wherein the nanotip field emitter comprises a tip having dimensions on the order of an atom.

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5 34. A system according to Claim 28 wherein the coherent radiation comprises laser radiation.

35. A system according to Claim 28 wherein the holographic projection of the desired image comprises a Fresnel hologram.

10 36. A system according to Claim 28 wherein the radiation source projects the coherent radiation along divergent paths.

37. A system according to Claim 28 further comprising:
a filter that is configured to filter the coherent radiation reflected off the
15 reflector surface to reduce transmission of portions of the interference pattern corresponding to defects on the reflector surface.

38. A system according to Claim 28 wherein the radiation source comprises two radiation sources that are each configured to project a
20 respective beam of coherent radiation toward the reflector surface.

39. A system according to Claim 28 wherein the radiation source is further configured to project coherent radiation toward a second reflector surface so that the coherent radiation is reflected off the second reflector
25 surface to project a second holographic projection of reflected radiation on the layer.

40. A system according to Claim 28 wherein the radiation source projects a portion of the coherent radiation to the layer without reflecting off
30 the reflector surface.